

Background-field of invention

This invention relate to crossover networks, audio ports, electronic coupling mediums and electronic acoustic hearing aids, for enhancing a communicating audio section.

Background--Description of Prior Art

Wireless communication are exiting new concept, but can also be harmful communicating devises. Telecommunication apparatus are used any where from a personal habitant to automobiles.

2

Today, there are many laws passed throughout the country banning telecommunication devices from motor vehicles, such as US public law 100-394, August 16, 1988, requiring hand held communication devices to be coupled with an external hearing aid, because of its potential hazard to motorists and pedestrians.

3

Despite the danger. The handheld telecommunication apparatus have evolve to become a main source of communication. However; in order to bypass some of the occupying distractions and hazard of communicating while performing a physical task, magnetic coupling hearing aid are adopted to a communicating section to aid in communicating in an un-occupying manner.

4

A prior invention relating to a magnetic aid for hearing is US Patent number 5,740,257 by Marcus; Larry Allen April 14, 1998, which describes a magnetic coupling hearing aid with active noise control for eliminating noise by generating a representation of the original input signal, employed to drive an individual external earphone, position for easy access to a user. A receiving apparatus disposed into the ear cavity for signal response, and to drive a magnetic field, comprising an interior cavity and a audio output port for inputting signals to a ear cavity, having a receiver in said interior for receiving a audio signal, and transducer for communicating with said ear cavity.

These plugged-in magnetic hearing aids devices, are some time manufactured with handheld telecommunication devises, and they are compatible with most telecommunication devices. Magnetic field hearing aid or headsets are used on a communication device to bypass the occupancy of an hand held telecommunication device. But, a user is still occupied with an annoying headset, plus a handheld telecommunication device while communicating, when using a magnetic coupling hearing aid with a wireless communicating device.

Unlike "Audio-Cell" wherein a coupling method execute a touch-free, hands-off, remote way of communicating.

6

Magnetic coupling hearing aid bring on increase of body temperature while your body is active, they also cause friction, and can affect a users hearing, therefore this becomes a great negative drawback for the magnetic coupling hearing aid devices.

Most prior art in this field do not emphasize the acoustic section of a communication apparatus enough. Audio related article are not that concern with sound efficiency but there attention is directed in other areas such as recording, access dialing and voice activated access. A related article to audio sound is patent number 4,537,018 by Shiramizu; Takami

7

August 27, 1985 the invention contemplate the use of variable frequency dividers, for separating the frequency of a clock pulses by a programmed input that are responsive to tones and active signals from a keyboard. A musical instrument comprising a code generator that's responsive to a operating key for generating a code indicating tone pitch, and another code indicating a active operated key. A second frequency could be preset and divide to a another count value. These frequency dividers are used in this article to detect a pitch or tone that function from a key pad and eject a band of unwanted frequency. In this article sound is produce from said keypad and not from a verbal audio system.

8

Although multi feature options on a wireless telecommunicating apparatus are nice to have, such as, Wireless Web, and Voice Activated-Dialing. The main key factors such as, the sound quality that's produced from a modems audio section is often overlooked, and there advantages usually rely on there capacity to hold a plurality of characteristic displays. But these different function does not give a user a clear audio signal while communicating.

Unlike the present invention. "Audio-Cell" wherein audio signals are carefully divided into levels of individual band of frequencies, processing clear audio signals.

9

communicated signal. To provide a unique coupling method.

Audio signals are carefully emphasized to bring a clear band of signals in a communication apparatus. A person can communicate using a handheld communication apparatus more remotely, with little to no hazardous or harmful results.

a) Magnetic hearing aid, or headsets, coupled to a communication apparatus occupies a users hearing capacity therefore put a person at risk to any potential operating hazard.

10

A major advantage of the present invention "Audio-Cell" is, it's convenient no touch communicating feature, in which verbal communication can be executed more remotely.

- a) One can control a wireless communication device from a distinct audio system.
- b) To give a crystal clear quality to communication enabling a user to receive and transmit communication to his or her selected preference.
- c) To give motorist and civilians an option to operate a communication apparatus safely without breaking the law and govern communication to there chose.

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11

Drawing Figures

In the drawings, closely related figures have the same numbers but different alphabetic suffixes.

Fig. 1 Show a signal flow chart illustrating a divided band of signals flowing through a entire system.

Fig 2 show a perf-board without any components.

Fig. 3A to 3F show a Schematic diagram of band-pass filter circuits a input point, and illustrates connections.

Fig 4A to 4G show a schematic diagram of tunable means, switches and illustrate connections.

12

Fig 5A to 5H show pictorial and schematic diagrams of an integrated coupling medium.

Fig. 6A show a schematic diagrams of an amplifying section, three divided input channels, and a method of connection.

Fig. 6B show a show receiving output section and illustrates connections to a external audio port.

Fig. 6C illustrated connections from a receiving section to a displaying means.

6D illustrates connections with a receiving input section, a transmitting input section, and amplifier's out put terminals.

13

Fig 7A to 7F show pictorial diagrams of exterior connections, from a communication device to a distinct reproducing audio system, located in a motor vehicle.

Fig 8 show a schematic ruff draft of an entire constituted system.

Fig 9 show a single channel flow chart of a entire system's signal flow.

Fig. 10 A to 10 B illustrates external tuning and adjusting for operation.

Fig. 4D illustrates a battery connection to a crossover network.

14

Reference Numeral In Drawings

- 11 base of filter
- 14 negative terminal
- 15 positive terminal
- 17 audio integrated coupling medium
- 18 wire conductor
- 20 capacitor
- 21 inductor
- 22 male connector
- 23 female connector
- 24 signal flow
- 25 input terminal
- 26 output terminal
- 27 displaying means
- 28 amplifying section
- 33 transistor

15

- 34 High band filter circuit
- 35 Low band filter circuit
- 36 Midrange bad filter circuit
- 37 Engagement
- 38 Tweeter
- 39 Midrange speaker
- 40 Woofer
- 41 communication apparatus
- 42 Filter circuit
- 43 Cross section
- 44 Conductor
- 45 Battery
- 46 Center pole
- 47 Crossover network
- 50 one element
- 51 two element
- 52 load resistor
- 53 signal flow

16

- 54 IC chip
- 55 Variable pole
- 56 Variable pole
- 57 Variable pole
- 58 variable pole
- 59 variable pole
- 60 variable pole
- 61 Plug
- 62 reproducing audio system from a motor vehicle
- 63 audio input from a motor vehicle's audio system
- 64 Vcc terminal
- 65 Tune resistor
- 66 Earth ground terminal
- 68 Bottom end of a communication apparatus

17

69 One side of a communication apparatus

70 Contact point

71 Keypad

72 The shell of a plug

74 high frequency signal

75 midrange frequency signal

76 low frequency signal

78 Volume switch

79 Top of switch

80 Bottom of switch

81 Notch

82 Knob

83 Tuner switch

84 Microphone

85 Receiving audio section

86 transmitting audio section

87 audio port

Year	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100
1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	

19

In the illustration Fig 2 the board **11** is the base of a filter circuit. It is a thin piece of Perf-board made of a plastic material. The board is 2x2 in length and 2x2 in width. It can be miniaturized into a micro chip for a better enclosure, or it can be modified in any formation.

20

The description below illustrates a crossover network connecting to a input port coupling means, for a responding microphone input signals. Fig 3E illustrates, a port coupling means **87** connecting to the main input **25** of a high band-pass filter circuit in a crossover network circuit. From the positive terminal **15** of a high band-pass one element filter circuit, a contact is made to a conductor **44**. From the opposite end of the same conductor, a contact is made to the positive terminal **15** of a port coupling means **87**. From the negative **14** terminal of the same port coupling means, a connection is made to the negative terminal of said high band pass one element filter circuit.

21

Fig. 11 illustrates a connection of a 5 volt battery from a communication apparatus's power source, to a crossover network circuit. The positive terminal **15** from a one element high band-pass filter circuit is connected to a conductor. At the opposite end of said conductor, a contact is made to the positive terminal of a 5 volt battery **45**. The negative terminal **14** of the same battery is connected to a conductor. From the opposite end of the same conductor, a connection is made to the negative terminal of a one element low band-pass filter circuit.

22

Fig. 3C show a schematic diagram of three band-pass filter circuit and illustrates the farming of a crossover network. A one element high band-pass filter circuit **34**, lay adjacent to a two element **51** high band-pass series filter circuit **34**. A one element low band-pass filter circuit **35**, lay adjacently below both high band-pass circuits. In the illustration Fig. 3C and 3A. From one end of an inductor from a low band-pass filter circuit's positive terminal, **15** an intersection is made, crossing **43** a negative conductor **44** of a high band-pass two element **51** circuit, and making a connection **70** at the positive terminal **15** of the same high band-pass two element filter circuit, coming in contact with one side of a series coupled inductor **21**.

23

From the same contact **70** point, another intersection is made crossing **43** a second negative conductor **44** of a high band-pass one element **50** filter circuit, and making contact **70** at the circuit's positive terminal, **15** and one side of a capacitor. From the negative terminal **14** of a low band-pass one element circuit. A connection **70** is made, to a negative conductor **44** of a high band-pass two element filter circuit.

From the negative conductor connection point **70** of the same high band-pass two-element filter circuit, a second contact is made to the negative terminal **14** of a high band-pass one element filter circuit, by the main input terminals.

24

A three way crossover network **47** is then formed, leaving a main input **25** at the high band pass one element filter circuit terminals. Output signal **26** flows **53** to the opposite side of the circuit's terminals. Illustrated in Fig. 3B, where, the low signal **76** outputs at a low band-pass one element filter circuit, the high signal **74** output at a high band-pass one element filter circuit, and the midrange signal, **75** outputs at a two element high band-pass filter circuit.

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Fig 4E show a switch, a IC chip, tunable means and peaking means, and illustrates the constitution of a unique integrated circuit. The center pole of a switch comes in contact with a MF8 timer IC chip. The diagram in Figs 4A to Fig 4G and Fig 4E illustrates connections of a switch and a IC chip. From a 5 volt positive vcc terminal **15** contact **70** is made to the center-pole **46** of a multi-position rotary switch. From a output **26** point of the IC chip, a contact **70** is made to a conductor of a male connector. The male connector engages **37** with a female connector.

26

From the opposite end of the same female connector's conductor, **44** a contact is made to one side of a tunable resistor's **65**. From the connection point **70** of the tunable resistor, a connection is made to the positive terminal **15** of a one element high band-pass filter circuit. From a one element low band-pass filter circuit, a connection is mad to the opposite side of the same tunable resistor, then to a conductor of a male connector. The male connector then engages with a female connector. The female connector's conductor then make a contact **70** to the negative **14** output terminal of the same IC chip.

Fig. 4 A illustrates a multi-position rotary switch connecting at the input of a crossover network. Horizontally to a right from the center pole **46**. A variable pole **55** using a conductor, **44** makes a contact **70** to the negative input terminal **14** of a low band-pass **34** one element **50** filter circuit.

From the positive terminal **15** of the same low band-pass filter circuit, a conductor makes a connection at it's opposite end to a variable pole **56** that's adjacent to pole **55**. The pole that's vertically upward from the center pole **46** is pole **57**. From a conductor, pole **57** makes contact with the negative terminal **14** of a high band-pass midrange **36** two element **51** filter circuit.

28

From the positive input terminal **15** of the same two element high band-pass **34** midrange **36** filter circuit. A conductor makes contact with a variable pole adjacent to pole **57** which is pole **58**. From a conductor, a pole **60** horizontally to the left from the center pole **46** makes contact to the conductor's opposite end, then to the positive input terminal **15** of a high band-pass one element **50** filter circuit.

A variable pole **59** that's adjacent to pole **60**, then makes contact from a conductor's end, to the negative terminal **14** of the same high band-pass one element filter circuit.

29

Fig 4C consist of more than one audio channels and illustrates a connecting method, illustrating connections from a amplifier to a crossover network. The transistor elements used in the illustration shows several engagements from a crossover network circuit, to the input of an amplifier circuit.

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Illustrated in Fig. 6A Fig 6C and Fig. 3D illustrates three divided channel connections from the output of a crossover network circuit, to the input of a amplifier circuit and Fig. 3C shows an input point and a output point on said crossover network circuit. From the positive **15** output terminal of a high band-pass **34** one element **50** filter circuit, contact is made to the conductor of a male connector. **22.** From the same male connector, an engagement is made with a female connector **23.**

31

From a female connector's conductor, a contact is made to the positive input base terminal **15** of a transistor **33**. From the input negative earth ground terminal **66** of the same transistor, a contact is made to the conductor of a female connector **23**.

From the same female connector an engagement is made with a male connector **22**.

From the same male connector's conductor, **44** a contact is made to the negative output **26** terminal **14** of a one element **50** high band-pass **34** filter circuit.

From a input load resistor's **52** positive terminal, **15** a contact is made to the conductor **44** of a female connector **23**.

32

From the same male connector's conductor, **44** a contact is made at the output **26** positive terminal **15** of a two element **51** high band-pass **34** filter circuit. From the negative output terminal **14** of the same band-pass two element filter circuit. A contact is made to the conductor **44** of a male connector **22**. From the same male connector, an engagement is made to a female connector **23**. From the same female connector's conductor **44**, a contact **70** is made at a earth ground **66** negative terminal **14** of a audio transistor **33**.

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From a second transistor **33** of said amplifying section, a contact is made from the positive terminal **15** of a transistor, at the base input terminal, to the conductor of a female connector. From the female connector, **23** an engagement is made to a male connector **22**. From the same male connector's conductor, contact is made at the positive terminal **15** of a low band-pass **35** one element **50** filter circuit. From the same low-band **34** pass one element **50** filter circuit's output negative **14** terminal, a negative connection **70** is made to the conductor **44** of a connector.

34

From the same connector, of the low band-pass filter circuit an engagement **37** is made with another connector. From the same connector, a connection is made to a input earth ground negative terminal of the same audio amplifier's transistor.

Fig. 1 illustrates a plurality of band audio signals, produced from a crossover network flowing through out the system in at least three divided channels. From a microphone **84**, a plurality of signals flows to a crossover network. From a crossover network **47**, at least three are less individual band of signals are injected to a audio amplifier section.

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From a audio amplifier **28**, a high frequency range of output signals **74** is connected to the input channel of a transmitting audio section **86**. From a mid-range of output signal **75** from said amplifier, a second connection is made to a second input channel of said transmitting audio section. From a low range of output signal **76**, a third connection is made to a third input channel of said transmitting section.

36

Fig. 1 illustrates signal flows from a audio contact point to the input channels of a receiving audio section. From a high range of output frequency signals, a contact **70** is made to one channel of a receiving section. From a midrange of output signals contact point **70**, a second connection is made to a second input channel of said receiving audio section. From a low-range of output signals contact point **70** , a third connection is made to a third input channel of said receiving audio section. A display apparatus **27** is coupled respectively to said receiving output signals for displaying said signal's status. Said output signals is then couples to a integrated cable where it then couples with a external audio system.

Fig. 6D Shows inside connections from a amplifier to the input of a receiving section and a transmitting input section. In the description below, audio input channels are first connection to a transmitting section. A positive input connection is made to the positive **15** base terminal of a transistor, in a transmitting audio section. A negative **14** input connection is made to the earth ground terminal **66** of the same transistor, in said audio section. A positive **15** input connection is made to the base terminal of a second transistor, in said transmitting audio section.

38

A negative input connection is made to the earth ground **66** terminal of said second transistor. A third input connection is made to said second transistor's positive base terminal, in said audio section. A input connection is made to another ground terminal of said second transistor, in said audio section.

39

Fig 6D illustrates a audio input connection, from the above plurality of audio sections to a receiving section. A positive **15** input connection is made to the base terminal of a transistor, in a receiving audio section **85**. A negative input connection is made to the earth ground terminal **66** of the same transistor, in said audio section. A input positive connection is made to the base terminal **15** of a second transistor. A negative input connection is made to the earth ground terminal of said second transistor. A third input connection is made to said second transistor's positive base terminal.

40

A third connection is made to another ground terminal of said second transistor, in said receiving audio section. From a output contact point from said receiving section, high frequency signals is connected to a tweeter **38**. From a second output contact point from said receiving section, midrange frequency signals is connection to a midrange speaker **39**.

41

From a third contact point from said receiving section, low range frequency signals is connected to a woofer speaker 40.

Illustration Fig 6B.

Illustrates a connection from a receiving section to a output coupling port, adapted for external coupling. From the positive **15** collector terminal of a transistor, on a receiving section, a connection **70** is made to a series capacitor. At the opposite end of said capacitor, contact is made to the positive terminal **15** of a female port coupling means **87**. From the negative terminal **14** of said port coupling means, a conductor **44** comes in contact with a earth ground terminal at the opposite end of said conductor.

43

Fig. 5A to 5G. shows a audio cable comprising a integrated circuit, adopted to oppose a band of frequency, wherein a positive conductor wire is parallel to a negative conductor wire, and they both flow in a separate parallel motion, having one side of the circuit conducting low rang frequency, and the other side conducting high range frequency. The internal consist of, two wires which runs parallel until the output plug contact points.

The cable also consist of two separate filter circuit, adjacent to each other. From the left side of a plug a conductor wire **18** makes contact to one end of an inductor. A second conductor wire, makes a contact from the opposite end of said inductor **21** to the left side of a second plug.

From the right side of said second plug **61** a conductor wire **18** makes contact to one end of a capacitor. A second conductor, then makes contact to the opposite end of said capacitor. At the opposite end of the same conductor-wire **18**, a connection is made to the right side of the first plug **61**.

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Fig. 8 Illustrate a ruff draft view of signal flows through out a entire system. Signal flows **53** from a microphone output **26**. Horizontally to the right is a crossover network. From the microphone's output, signals are sent to a 3-way crossover network **47**, which then applies input signals to a amplifier **28**. Horizontally to the right of said amplifier is a audio transmitting section. Said amplified signals from the amplifier is entered into said transmitting section. Vertically to the left of the transmitting device **86** is a receiving audio section **85**, where said input signals are respectively join to the input of said audio receiving section.

Vertically down from said receiving section **85** is a acoustic electronic integrated medium **17**, which is adopted to transport said output signals to an input port of a motor vehicle's acoustic reproducing system, where said signals are reproduced and output to at least one magnetic hearing aid.

Operations Figs 7 to 10 and Fig 3B

A crossover network coupled with a communication apparatus, and an integrated medium, join with a external reproducing acoustic system. One would start operating by connecting the system for operation illustrated in the pictorial view in Fig. 7A, One must first hold a microphone's coupling medium **17**, griping a plug **61** by it's shell, then insert the plug into a microphone's external input **25** port **87**, located on one side of a communication apparatus, as illustrated in Fig. 7A.

48

After the microphone is in,
a filtering coupling medium with a 1/8
inch plug at each end, is applied to one
bottom side of a communication apparatus,
gripping one end of a 1/8 inch plug's shell
72 as illustrated in Fig 7B and Fig. 7E
then insert the plug at the bottom side **68**
of said communication apparatus into a
female output **26** port **87** of a receiving
section. At the opposite end of the same
coupling medium, shown in Fig. 7C and
Fig. 7F and apply a connection to the
input port **25** of an external reproducing
system. When the connections are through
with. Press the power button on said
communication apparatus to apply current
signals through out the entire circuit.

49

When a electronic audio function is executed, signal flow through out the system, then couples externally to an external independent reproducing system. Figs 3B and Fig. 1 illustrate a plurality of divided signal flowing through out the system. From a microphone out-put terminal. Input signals are applied to a three-way electronic crossover network **47**. Signals are then divided into three different band of frequencies. illustrated in Fig. 3B. A high band frequency, **74** which initialize from a high pass filter circuit. A midrange band of frequency, **75** which initialize from a two element high pass filter circuit, a low band of frequency, **76** which, output from a one element low band-pass filter circuit.

50

The three signals are then applied at the input of an amplifier, then input to a transmitting section **86** where said signals makes another input connection to the input of a receiving section. **85** The same three separate output signal from the said receiving section, is applied to a female output port **87**. When said port is coupled with a cable, signals are also transported from the telephone audio receiving section to a coupling medium **17**, which, then couples to an external reproducing system and injected into a (CD) Compact disc input socket **25**, where audio signals are reproduced in an external audio system.

51

At least three individual bands of frequency signals are sent to a transmitting input section, where said signals are transmitted to a remote user at the opposite end.

Sound frequency on a telecommunication apparatus is tuned by a switch means, located on a keypad **71** illustrated in Fig 10A. One can start adjusting the frequency by selecting a band of frequency for operation. Using your hands, grip the knob **82** of a rotary switch. Twist said knob to the appropriate selected notch **81**. A volume control push button switch is used to increase, or decrease the frequency selected by said rotary switch. As illustrated in Fig. 10B. Press on the top end **79** of the switch, to increase the volume of a band selected frequency.

Summary Ramifications and Scope

Accordingly one can see that a tunable crossover network having at least three audio channels, is employed for emphasizing signals entering an amplifying means, wherein an amplifier is adopted for peaking said signals respectively inputting to a transmitting section, where said inputting signals intercept and connects to a second input of a receiving section. The receiver section further includes, an output port for external coupling with an electronic coupling medium, said medium further having an integrated filter circuit to oppose a plurality of frequency. Said coupling medium is employed for coupling with a motor vehicle's reproducing acoustic system.

54

Approximately at the same interval, the inputted signals to said transmitting section, transmit said plurality of signals to a responsive functioning means, then to a remote user on a receiving end. An acoustic coupling medium combine with a receiving section, could be used to join a motor vehicle's reproductive acoustic system with a communication apparatus. One can also see that, a crossover network enhance the common communication apparatus's audio efficiency and performance.

One can also notice that, a tunable selector means, coordinating with a volume tuning means, gives one the option to select and boost an individual band of frequency, It can easily be used while operating a vehicle. The sound separation brings good audio quality. The combination of a communicating apparatus, and a external coupling medium, and an external audio system, create a remote way of communicating. A user can transmit, and receiving communication without occupying his or herself.

56

Furthermore advantages of the crossover network comprising means for coupling externally include that;

- it eliminate the use of headphones or headsets that occupy a users hearing cause hazards;
- it eliminate distortion, and bring forth a clear audio reception;
- it bring forth a new way to communicate; due to the conjunction of on external system;
- it execute communication in a non occupying manner and enable a touch-free way to communicate;
- it bypass radioactive waves that initialize from a radio communication apparatus;

- it can adjust audio frequencies to once satisfaction or once preference;
- it can enable one to tune microphone input signals and microphone output signals.
- It enable a user to control audio communicating signals externally, using an external audio system.

Although the description above contain many specificity's, these specific factors should not be considered as a limit to the scope of this invention but as illustrations of preferred embodiments.

A pushbutton switch could be added for selecting instead of a rotary switch. A displaying mean could be used to display the current signal status. The filter circuit can be miniaturized for a better installation closure. A plurality of tuning means could be added to the crossover network system. The crossover network could be electronic are non electronic. The receiving port could be coupled using a non integrated medium.

Additional element could be added to the electronic crossover network system such as resistors, capacitors diodes, transistors and inductors for better performance. Elements in the crossover network could be coupled in parallel or in series order.

Thus the scope of this invention should be determined on the appended claims and their legal equivalent, rather than by the given examples.